CLEAN ENERGY FUNDS: AN OVERVIEW OF STATE SUPPORT FOR RENEWABLE ENERGY

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Abstract

As competition in the supply and delivery of electricity has been introduced in the United States, states have sought to ensure the continuation of "public benefits" programs traditionally administered or funded by electric utilities. One of the most popular policy mechanisms for ensuring such continued support has been the system-benefits charge (SBC). This paper summarizes the status and performance of fourteen state renewable energy funds supported by system-benefits charges, and is based on a more detailed recent LBNL report that can be downloaded from the web at http://eetd.lbl.gov/ea/EMS/EMS_pubs.html#RE.

Introduction

Across the United States, as competition in the supply and delivery of electricity has been introduced, states have sought to ensure the continuation of "public benefits" programs traditionally administered or funded by electric utilities. Many states have built into their restructuring plans methods of supporting renewable energy sources.

One of the most popular policy mechanisms for ensuring such continued support has been the system-benefits charge (SBC), a non-bypassable charge to electricity customers (usually applied on a cents/kWh basis) used to collect funds for public purpose programs. Thus far, at least fourteen states have established SBC funds targeted in part towards renewable energy.

This paper discusses the status and performance of these state renewable or "clean" energy funds supported by system-benefits charges. As illustrated later, existing state renewable energy funds are expected to collect roughly $3.5 billion through 2012 for renewable energy. Clearly, these funds have the potential to provide significant support for clean energy technologies over at least the next decade.

Because the level of funding for renewable energy available under these programs is unprecedented and because fund administrators are developing innovative and new programs to fund renewable projects, a certain number of program failures are unavoidable. Also evident is that states are taking very different approaches to the distribution of these funds and that many lessons are being learned as programs are designed, implemented, and evaluated. Our purpose in this paper is therefore to relay early experience with these funds and provide preliminary lessons learned from that experience.[1]

[1] The full version of this report, complete with detailed case studies of each of the fourteen SBC funds, can be downloaded from http://eetd.lbl.gov/ea/EMS/EMS_pubs.html#RE.

Overall Funding

Table 1 illustrates the funding levels and fund duration of the fourteen state SBC programs that currently exist and are covered in this paper. Figure 1, meanwhile, shows aggregate annual and cumulative fund collection over the 1998 – 2012 timeframe. While aggregate and per-capita funding levels vary considerably by state, nationwide funding for renewable energy through 2012 stands at $3.5 billion. Given current information, aggregate annual fund collection for renewable energy ranges from $175 million to over $250 million during this period. This level of funding is considerable by almost any standard.

TABLE 1. FUNDING LEVELS AND PROGRAM DURATION

State	Approximate Annual Funding ($ million)	Per-Capita Annual Funding*	Per-MWh Funding*	Funding Duration
CA	$135	$4.0	$0.58	1998 – 2011
CT	$15 → $30	$4.4	$0.50	2000 – indefinite
DE	$1 (maximum)	$1.3	$0.09	10/1999 – indefinite
IL	$5	$0.4	$0.04	1998 – 2007
MA	$30 → $20	$4.7	$0.59	1998 – indefinite
MT	$2	$2.2	$0.20	1999 – July 2003
NJ	$30	$3.6	$0.43	2001 – 2008
NM	$4	$2.2	$0.22	2007 – indefinite
NY	$6 → $14	$0.7	$0.11	7/1998 – 6/2006
OH	$15 → $5 (portion of)	$1.3	$0.09	2001 – 2010
OR	$8.6	$2.5	$0.17	10/2001 – 9/2010
PA	$10.8 (portion of)	$0.9	$0.08	1999 – indefinite
RI	$2	$1.9	$0.28	1997 – 2001
WI	$1 → $4.8	$0.9	$0.07	4/1999 – indefinite

* Annual per-capita and per-MWh funding figures are based on funds expected during 2001 (with the exception of: New Mexico, which does not start until 2007; Oregon, for which we used an expected annual figure instead of just the last three months of 2001; New York, for which we used the $14 million per year figure; and Wisconsin, for which we use $4.8 million). Note that funding scope differs by state, meaning that strict inter-state comparisons may be misleading. For example, NYSERDA's fuel cell budget is outside of the Energy $mart renewable R&D program and is not included in this table, while fuel cell funding is included in the funding levels reported for other states.

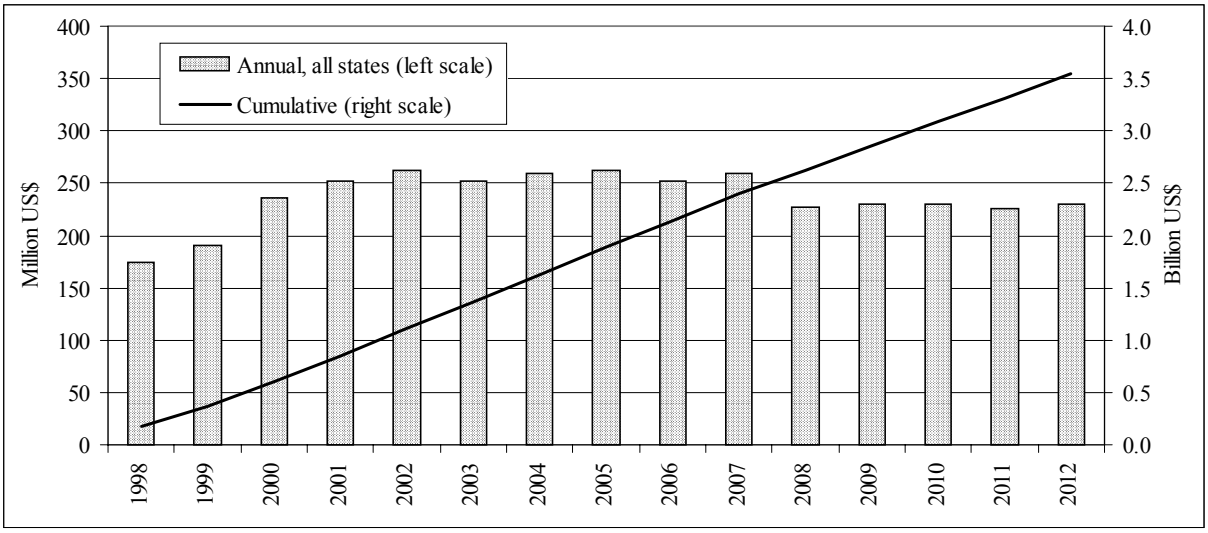

FIGURE 1. AGGREGATE ANNUAL AND CUMULATIVE STATE FUNDING

Technology Eligibility and Fund Administration

Table 2 identifies the renewable technologies that are eligible for support from each state's SBC fund.[2] Wind and photovoltaic (PV) energy are eligible for support from virtually every fund. Geothermal electricity is also eligible under many of the funds, but is frequently a strong target for support only where economic resource potential exists in the West. Landfill gas has proven to be moderately popular, especially in states that do not simultaneously have a renewable portfolio standard (RPS) to support such near-market technologies. Fuel cells (using either renewable or non-renewable fuels) have also been targeted by many funds, especially in states with limited wind and solar resources and difficult project siting constraints, such as in the Northeast. Biomass power production, with various restrictions, is eligible in most states, though only a few funds have actually supported such projects thus far; hydropower has been treated similarly. Finally, non-electrical renewable energy applications, such as geothermal heat pumps and daylighting, have been targeted by some funds.

TABLE 2. RENEWABLE RESOURCE ELIGIBILITY

State	Wind	Solar	Geothermal	Biomass	MSW	Ocean-based	Hydro	Fuel Cells*
CA	●	●	●	●	●	●	●	●
CT	●	●		●		●		●
DE		●						
IL	●	●		●			●	
MA	●	●		●	●	●	●	●
MT	●	●	●	●			●	
NJ	●	●	●	●		●		●
NM	●	●	●	●			●	●
NY	●	●	●	●			●	●
OH	●	●		●			●	●
OR	●	●	●	●	●		●	
PA	●	●	●	●	●		●	●
RI	●	●		●			●	●
WI	●	●	●	●		●	●	●

* Unless otherwise specified in the full report, fuel cells are not required to use renewable fuels. States that have not specifically defined fuel cells as eligible for funds have not been marked, even though fuel cells would presumably be eligible for renewable energy status as long as they use a renewable fuel.

Administrative structures and responsibilities for the fourteen SBC funds studied vary considerably across states. Many of the funds are administered by state energy, commerce, or environmental agencies. Other funds are administered by quasi-public business development organizations. Still other funds are or will be managed by independent third party organizations or by the existing electric utilities. Two states allow large customers to "self-direct" their SBC funds, if desired.

Program Status and Design

For the most part, states are still in the very early stages of obligating program funds. Eight states – California, Connecticut, Illinois, Montana, New York, Pennsylvania, Rhode Island, and Wisconsin – have already spent funds on renewable energy projects and programs. Even among these states, however, only a few years of experience is available.

Given the dearth of past experience at the state level in spending public funds directly to support renewable energy, it is perhaps not surprising that states are adopting very different views about how best

[2] For detailed notes to Tables 1 and 2, see the full report at http://eetd.lbl.gov/ea/EMS/EMS_pubs.html#RE.

to target their SBC funds towards renewable energy projects and programs. While each state differs, and many states incorporate elements of each model to some degree, we observe that the fourteen system-benefits charge programs can be more or less categorized into three different models:

- **Investment Model** – Using loans, near-equity and equity investments to support renewable energy companies and projects. The Connecticut Clean Energy Fund has historically epitomized the investment model category, which could also include Pennsylvania and Massachusetts.
- **Project Development Model** – Using financial incentives such as production incentives and grants to directly subsidize and stimulate renewable energy project installation. California is perhaps the best example of this approach, though numerous other states, including New Jersey, New York, Montana, Rhode Island, Delaware, and Illinois also follow this model.
- **Industry and Infrastructure Development Model** – Using business development grants, marketing support programs, R&D grants, resource assessments, technical assistance, education, and demonstration projects to build renewable energy industry infrastructure. Wisconsin's program is indicative of this approach.

Which model a state uses appears to depend in part on the goals of the fund, the size of the fund, the renewable resource potential of the state, the strength of the in-state renewable energy industry, and the organization selected to administer the fund. We offer the above categorization with two important caveats. First, we again note that most funds do not perfectly fit the mold of a particular model; most have remained at least somewhat flexible in their implementation, perhaps adopting elements of each of the three models. Second, the models themselves are not mutually exclusive and potentially overlap in certain areas. For example, one way to develop the renewables industry infrastructure is by investing seed capital in budding renewable energy companies.

Restricting our attention to only those eight states that have already begun to distribute a significant amount of funds, Table 3 summarizes the types of programs implemented thus far (programs that are planned but still under development are not included here).[3] As shown:

- Following the "project development" model, the most common type of program involves financial incentives for the development of new utility-scale renewable energy projects.
- Also popular are buy-downs and competitive solicitations for distributed generation projects (often PV), with buy-down levels ranging from $1.5/Watt to $6/Watt. To augment these programs, consumer-financing programs have been developed in three states.
- Four states have directly supported green power marketing in a variety of ways.
- Project or company financing – the hallmark of the "investment" model described earlier – has been used by two states thus far.
- A variety of industry and infrastructure development activities, including resource assessments, consumer education, and business development grants, have also been used.
- California and Wisconsin have been the only two states so far to conduct broad-based educational campaigns.
- Finally, only California has provided support for existing resources, though Illinois has funded the refurbishment of existing small hydro facilities.

[3] We note that this table is not intended to be entirely comprehensive. For example, many states have funded research studies that do not fall neatly into any of the categories identified in the table.

TABLE 3. PROGRAMMATIC ACTIVITIES OF ACTIVE FUNDS

Program Type	CA	CT	IL	MT	NY	PA	RI	WI
Financial Incentives for Large Scale Projects[4]	●		●	●	●	●	●	
Distributed Generation Buy-Downs	●		●		●		●	
Distributed Generation Competitive Solicitations				●	●		●	●
Consumer Financing Programs					●	●		●
Project or Company Financing		●				●		
Detailed Resource Assessment					●		●	
Business Development Grants					●	●		●
Broad-Based Customer Education[5]	●							●
Support for Green Power Marketing	●	●				●	●	
Support for Existing Projects	●							

Other states, not included in the table because they have not begun (or have only just begun) to obligate funds, have also developed some guidelines for the types of programs they will offer:

- **Delaware:** Delaware is developing a rebate program for PV and solar hot water and space heating that is expected to be up and running by July 2001.
- **Massachusetts:** During its first two years of operation, beginning in 2001, Massachusetts plans to focus on three programs: premium power applications for distributed generation (and fuel cells in particular), green buildings that utilize energy efficiency and on-site renewable energy, and wind development. Towards this end, Massachusetts issued several RFPs in the spring of 2001, targeting premium power planning and installations, consumer aggregation, and green power predevelopment financing for renewable electric generating facilities (including wind) of at least 1 MW located in New England.
- **New Jersey:** A generous buy-down program for customer-sited renewables,[6] as well as support for grid supply projects and market development and commercialization efforts, comprise the bulk of New Jersey's proposed program.
- **New Mexico:** Though the inception of the fund has recently been delayed until 2007, New Mexico tentatively plans to provide grants to public schools, local governments, and Native American communities to support the installation of renewable energy systems, including wind.
- **Ohio:** Though it is called the Energy Efficiency Revolving Loan Fund, Ohio's SBC fund expects to target renewables as well. The fund just began collecting money in 2001, and hopes to develop a distribution plan by the middle of the year. Legislation allows the fund to provide below-market loans, loan guarantees, and linked deposits.
- **Oregon:** In Oregon, a new nonprofit organization will administer the conservation and renewable energy portions of the SBC fund. A newly named board of directors is currently working on a strategic plan in preparation for the inception of funding in October 2001, though expected delays in electricity restructuring may also delay implementation of the fund.

[4] Wisconsin's DSARE program will fund large digester gas systems, but to date no projects have been funded.
[5] Other states have provided limited customer education (e.g., solar for schools curriculum), but only California and Wisconsin have thus far devoted a significant amount of resources to customer education activities.
[6] Buy-down incentives of as much as $5/Watt for up to 60% of installed costs will be available for small (<10 kW), customer-sited renewable energy systems, including wind. Lower incentives are available for larger projects.

Funding Results

Restricting our attention to some of the more popular program types, here we summarize early experience with the distribution of state SBC funds.

Financial Incentives for Large Scale Projects: Perhaps the most visible funding successes to date have come from the development of large-scale renewable energy projects. With the potential exception of Rhode Island, which initially tried in vain to find a suitable in-state wind site for utility-scale development, states that have targeted the bulk power market have been largely successful at obligating funds and beginning to bring new renewable energy projects on line.

Table 4 summarizes the program design used by and results from each of the six states that have supported large-scale projects to date.

TABLE 4. STATE SBC FUNDING OF LARGE-SCALE RENEWABLE PROJECTS

State	Form of Fund Distribution	Level of Funding	Results[7]	Discounted ¢/kWh Incentive over 5 Years[8]
CA	5-yr production incentive	$162 million	543 MW (assorted)	1.20
		$40 million	471 MW (assorted)	0.59
IL[9]	grant	$0.55 million	3 MW landfill gas	0.57
		$1 million	3 MW hydro	1.86
		$0.352 million	1.2 MW hydro	1.63
		$0.55 million	15 MW landfill gas	0.11
MT	3-yr production incentive	$1.5 million	3 MW wind	3.63
NY	grants with performance guarantees	$9 million	51.5 MW wind	1.95
		$4 million	6.6 MW wind	6.75
PA	grant/production incentive	$6 million	67 MW wind	1.00
RI	refundable grant	$0.15 million	unclear MW wind[10]	Unclear

[7] These results are projected and are based on announced results of solicitations. Only a fraction of the projects obligated funds are yet on line. Some (perhaps many) projects may ultimately be cancelled due to unforeseen circumstances, thereby lowering the total capacity supported. Furthermore, it is difficult to know how many and what size projects would have been built in the absence of state funding, and therefore to assess the true incremental effect of state policy investments. In the interest of simplicity, we have simply assumed that none of the projects would have been undertaken in the absence of state funds.

[8] Because incentive structures differ by state, to allow comparison we normalized all incentives to their 5-year production incentive equivalent assuming a 10% discount rate. To do this, we calculated the net present value of the projected cash outlay for each state using a 10% discount rate, and then amortized that net present value over 5 years using the same 10% discount rate. For California, we used projected 5-year electricity generation output from funded projects. For other states, we assumed a 35% capacity factor for wind power in Montana, a 25% capacity factor for wind in New York and Pennsylvania, a 90% capacity factor for landfill gas in Illinois, and a 50% capacity factor for small hydro in Illinois.

[9] Two comments related to the Illinois investments bear mention. First, the two hydropower projects represent refurbishments of existing small hydro plants. Second, for both landfill gas projects, funding was used to buy-down the cost of a single 1 MW turbine as part of larger 3 MW and 15 MW projects. Here we attribute the funding to the full project sizes.

[10] Rhode Island's refundable grant to a wind project in western Massachusetts allowed the developer to begin construction of the project and thereby retain permits that were nearing expiration. While this timely grant was no doubt critical to keeping the project on track, it is unclear how to attribute wind power capacity to the grant, particularly since the grant is to be amortized and "refunded" through power discounts to marketers wheeling the power into Rhode Island. If the project comes on line and does not sell its output into Rhode Island, however, the grant is refundable to the Rhode Island Renewable Energy Collaborative.

Based on this table (and other supporting data) we observe that:

- **Total Obligated Funds:** A total of $225 million has been obligated under these existing programs to new renewable energy projects, the majority of which comes from California.
- **Funding Types:** Programs have used a mix of financial incentive structures, from standard grants and production incentives to refundable grants. All incentives, with the exception of those in Rhode Island and Illinois, have been distributed after competitive solicitation processes.
- **Total Renewable Energy Capacity:** While many of the projects to which funds are obligated have not yet come on line, and some (perhaps many) may never be developed, a total of 1,164 MW could be installed if all projects that have been obligated funds were to come on line.
- **Renewable Resource Selection:** Wind has by far been the most-favored technology with nearly 880 MW of possible installation, followed by geothermal in California with 157 MW, and landfill gas with 101 MW. Biomass and hydropower have made lesser contributions.
- **Incentive Levels:** Because incentive structures differ by state, to allow comparison we normalized all incentives to their 5-year production incentive equivalent assuming a 10% discount rate. Equivalent 5-year production incentives range from a low of 0.11 cents/kWh to a high of 6.75 cents/kWh.

Distributed Generation Policies: Customer-sited distributed generation programs, including buy-downs, competitive solicitations, and consumer financing programs, have been equally popular among state funds, but have perhaps met with less success thus far, at least relative to initial expectations. This is perhaps due to a combination of factors including low consumer awareness, low buy-down levels in some states, and the high up-front costs of PV and other distributed technologies. Though six states (three of them only recently) now provide some form of support for small-scale wind systems, distributed generation programs have thus far largely focused on PV, with lesser emphasis on other technologies. In aggregate, approximately 7 MW of distributed generation capacity has been developed thus far or is likely to be installed shortly under distributed generation programs. The energy crisis in California has also recently spurred increased sales of these systems. Nonetheless, in response to the apparent initial under-performance of buy-down programs, several states are exploring new options for stimulating demand for distributed generation products.

Support for Green Power Marketing: With the introduction of customer choice in electricity markets, several SBC funds have also taken an interest in encouraging the development of the competitive green power market. States that offer direct support to this market are generally doing so with the goal of developing, over time, a sustainable market for renewable energy that is not dependent on continued subsidization. California, Pennsylvania, Connecticut, and Rhode Island have all made direct investments in this customer-driven green power market.

Observations and Lessons Learned

Because many of these efforts are so new, drawing firm conclusions from this early experience would be premature. Nonetheless, we offer preliminary observations and lessons – divided into administrative, strategic, and programmatic issues – that may assist state funds as they formulate their administrative structures and program funding strategies. We summarize our findings in the briefest possible manner in the text boxes below, and refer the reader to the full version of this paper (located on the web at http://eetd.lbl.gov/ea/EMS/EMS_pubs.html#RE) for further details and discussion.

Administrative Issues

- While there may be theoretical or philosophical grounds to favor one administrative approach over another, early evidence does not firmly establish any administrative structure as clearly most effective.
- Ensuring that a fund administrator has access to adequate staffing with expertise commensurate with the fund's goals appears to be as or more important than the particular administrative structure that is chosen.
- Outside input, including partnering with local non-profits, consultants, or other state funds, may be an effective way to augment staffing levels and expertise and may provide a fund with an invaluable source of information.
- Aggressive outreach and marketing to both renewable energy businesses and customers are critical to a fund's success.

Strategic Issues

- Given the limited renewable resources in some states and the regional nature of power markets and air sheds, out-of-state project funding may enhance a fund's impact and several funds are beginning to consider and fund out-of-state projects.
- State funds should consider more fully exploiting opportunities to partner with other states, given the common issues and experiences facing most funds.
- Experience in some states has shown that uncertainties and mixed signals in funding plans can cultivate a "wait and see" attitude among market participants that slows market development and, more importantly, that may result in lost funding opportunities for state funds.
- Fund managers should be conscious of other renewable energy incentives, in particular federal tax credits, state RPS policies, and other market rules and regulations, and should tailor their programs accordingly to increase fund leverage.

Programmatic Issues

We sub-divide these observations and lessons into the most popular programmatic activities to date: funding for large-scale renewable energy projects, renewable energy marketing, customer-sited distributed generation, and infrastructure-building activities.

Large Scale Renewable Energy Projects

- Competitive bidding, either through a formal auction or as a more open RFP, can lower project costs and thereby enhance fund leverage.
- If competitive processes are adopted, steps should be considered to minimize speculative bidding: a series of smaller auctions held at regular intervals, strict cancellation penalties, and increased administrator discretion may be used to combat undesirable bidding strategies.
- Funding should foster an incentive to perform; production incentives are one way to accomplish this, though a fund may increase its leverage by structuring a production incentive as an up-front grant, to be "earned" over time.

Renewable Energy Marketing

- Customer incentives should be carefully tailored to minimize distortions and encourage a sustainable market.
- Funds with an economic development slant may wish to provide direct support to renewable energy marketers through business development grants or direct investment, as has occurred in Pennsylvania and Connecticut.
- Non-residential renewable energy purchases can generate earned media exposure; funds may wish to specifically target such customers.
- State funds may help reduce customer acquisition costs by using their neutral status to mount education campaigns on customer choice generally and renewable power choice in particular.

Customer-Sited Distributed Generation Programs

- Buy-down levels generally need to be aggressive to encourage small PV system sales.
- Education, financing, and other market support activities may be critical to the success of these programs.
- Approaches other than buy-downs, such as targeted RFPs, innovative financing and leasing programs, and bulk purchases of distributed generation systems also merit consideration.
- Fuel cells and other distributed technologies may have different programmatic needs than PV, which has received the bulk of the attention to date.

Infrastructure-Building Activities

- Building industry and market infrastructure may be particularly important where limited renewable project experience exists.
- Many states have incorporated some form of infrastructure-building activity into their programs, including market assessments, resource studies, site prospecting, building distribution channels, early-stage investments, business development grants, and education and demonstration programs.

Conclusions

Between 1998 and 2012, roughly $3.5 billion will be collected by the fourteen state SBC funds currently in existence and used to support renewable energy development. These funds, working in combination with renewable portfolio standards and voluntary renewable energy marketing programs, have the potential to begin to transform renewable energy markets from their current niche status into a more mainstream source of energy. Positive early indicators of such a change are already emerging: large-scale wind farms, for example, now exist or are planned in states where they never have before, such as Montana, Pennsylvania, Massachusetts, and New York. In still other states, such as California, funding levels are high enough to potentially stimulate the installation of thousands of megawatts of renewable capacity.

Some states, of course, have had more success than others in promoting the use and development of renewable energy sources. To some degree, variation in success can be attributed to the different approaches states are taking to the distribution of funds. As highlighted in this paper, three very different funding models are being pursued – investment, project development, and infrastructure development – and states have developed a wide range of program types.

Despite the prospects for some funding failures, however, we believe that the diversity and adaptability of approaches taken to date is encouraging and will allow states to "learn by doing." Also encouraging is that fund management has, for the most part, remained dynamic, evolving according to market needs. For example, in response to the apparent under-performance of traditional buy-down programs, some states are beginning to pursue alternative approaches, while others are taking positive steps to improve their existing programs. Other states have re-allocated funds in response to strong demand for certain resources (e.g., wind in New York) or programs (e.g., new renewable energy in California).

In this paper we have summarized early experience with these SBC programs and have offered a number of observations based on that experience, but it is clearly still too early to draw definitive conclusions. Indeed, as experimentation flourishes on the uses of these funds, absolute successes and failure may only be identified over the course of a number of years.

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